

# Challenges of the Customer Organization's Requirements Engineering Process in the Outsourced Environment – A Case Study

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**Abstract.** [Context and motivation] The increasingly complex business and development environment brings challenges to IT system development and requirements engineering (RE) activities. [Question/problem] The goal of the case study was to investigate what the challenges of a customer organization's RE process are in the outsourced development environment and what demands these challenges bring to RE process development. The case study was conducted in a Finnish insurance company. [Principal ideas/results] The results are based on 17 interviews and the analysis of 15 large projects. The case study indicates that one of the biggest challenges is to develop business and IT as a whole. When combining business process and IT system development, requirements are an important tool. Another critical challenge in the outsourced environment is that the RE process is distributed between the customer organization and the supplier. Furthermore, highly integrated IT systems and enterprise architecture bring demands to RE process. [Contribution] The paper describes a complex environment in which the customer organization develops IT systems, and systematically defines challenges related to the RE process.

**Keywords:** RE process · Outsourced environment · Large complex projects

## 1 Introduction

Companies invest millions every year in IT system development aiming at adding business value to achieve strategic goals. IT projects consume customer organizations' resources and are seldom finished in accordance with their original schedule and budget or deliver the benefits expected [1]. To improve project outcomes, requirements engineering has been identified as one of the success factors in software projects [2] [3].

Today, many companies focus on core business and software development is outsourced to external suppliers. In outsourced processes, high-quality requirements are needed in acquisition, customer-supplier relationships need to be established and knowledge must be transferred between the customer and the supplier. The development environment has also become increasingly complex, and new themes have emerged in the RE field such as business process focus, systems transparency,

integration focus, distributed requirements, layers of requirements, packaged software, centrality of architecture and interdependent complexity [4]. Requirements are a notable risk for causing project failure [5] [6] [7] [8]. Most of the research of the outsourced project risks is focused on the vendor side of a project, but the client perspective has been ignored [8].

Large-scale and outsourced development projects can be a challenge for non-technical customer organizations and also the case study organization has faced these challenges in the large development projects. As a solution, the aim was to develop RE processes to better support projects. Straight forward answers to customer organization's RE process development issues were not available in the RE text books. Therefore, there is a need to understand current state of the customer organization to develop new RE processes and practices. The research question of the case study is: *What are the challenges of customer organizations' RE processes in the outsourced environment and what demands do these challenges bring to RE process development?*

## 2 Related Work

To understand the role of the customer in the RE processes, we studied definitions of the term "customer". One definition points out that requirements are specified and thus owned by the customer: "An individual or organization who specifies the requirements and formally accepts delivery of a new or modified hardware or software product and its documentation" [9]. Wiegers defines customer as "an individual or organization who derives either direct or indirect benefit from a product" [10].

The term "acquirer" is also used in the IEEE Software lifecycle processes standard [11] and the definition of the acquisition process includes, among others requirements definition, solution selection, RFQ (Request for Quotation) preparation and acceptance of the solution. However, we prefer the term "customer organization" to point out that, in addition to the acquirer part of the organization, the involvement of many stakeholders such as management, requirements analysts, business specialists, users and enterprise architects is needed.

Based on our literature review, RE of in-house development and product development has been studied (e.g., [3] [4] [12] [13] [14] [15] [16]). However, customer's viewpoint seems to be less discussed. Wiegers [10] defines requirements as a cornerstone of the outsourced development process. Hull et al. [17] identified stakeholder requirements management as the acquisition organization's main concern. Also RE challenges have been studied in the offshore outsourcing context. Bhat et al. [5] identified conflicting vendor-client goals, low client involvement, conflicting RE approaches, disagreements in tool selection, and communication and sign-off issues as challenges in a global IT-services organization. Furthermore, based on three case studies, Abdullah and Verner [7] [8] identified conflicting, over-specified, inadequate, incorrect and unclear requirements as project risk factors. The significance of different RE practices in the outsourced projects [18] and coordination of vendor and client of outsourced development projects have also been studied [19].

### 3 Research Method

#### 3.1 Case Study Organization

The case study organization was an insurance company that specializes in statutory pension security in Finland. The company has more than 560 employees. Its business is information centric and legislated. The number of IT systems is 210 and these systems are highly integrated. In the past, the company had an internal IT department that was responsible for the development, maintenance and production of IT systems and also knew the business part well. IT system development was outsourced 2006 and is nowadays provided by external suppliers. Most of the suppliers are well known international software suppliers.

The RE process of the case study organization was defined during the years 2006-2007. The RE process description and guidelines are simple. They include basic activities such as requirements elicitation, analysis, specification, validation, and management. A small set of RE practices such as requirements collection workshops, usage of Office templates to document requirements and requirements reviews are recommended and they are used in most of the IT development projects.

#### 3.2 Data Collection and Analysis

The research was performed based on interviews, document reviews and validation workshops (Table 1). The interviews were semi-structured and they were conducted in Finnish. The themes of the interview questions were

- changes in the development environment and effects upon RE
- RE experiences from large development projects
- demands and development ideas to improve the RE process

**Table 1.** Summary of data collection methods

Method	Data collection
Interviews	17 interviewees were selected based on the organizational and project roles to comprehensively represent different kinds of projects and organizational functions responsible for RE and project work.
Documentation review	The requirements and project documentation of 15 large strategic outsourced projects were studied.
Validation workshops	To validate the findings, 5 workshops were performed with the interviewees and other RE practitioners of the case study company.

The questions that have been translated into English are available in the interview guide [20]. The interviewees included five business developers/specialists, three steering group members of IT development projects, two requirements definition specialists, two process developers, two IT managers, two IT architects, and one project manager. The duration of the individual interviews was approximately an hour. All the interviews were recorded and transcribed.

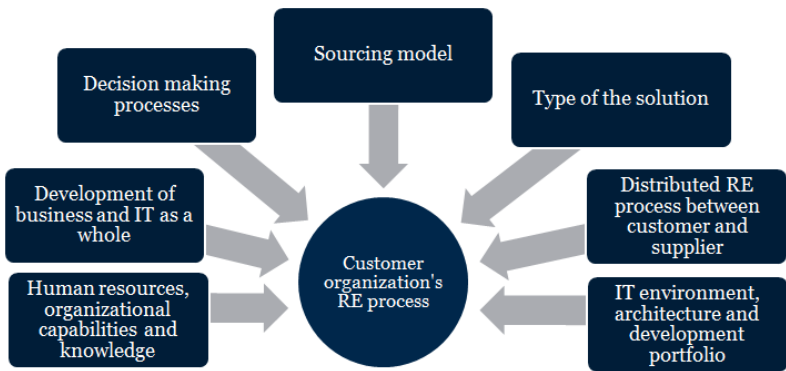
In addition to the interviews, requirements documents, project plans and final reports of 15 large projects were studied from the RE point of view. These projects covered all strategically important outsourced IT system development of the case study company during 2006-2014 and they were typically delivered by multiple suppliers. The costs of the projects varied from 1M€ to 35M€.

The interview data was analyzed iteratively. The unit of analysis was large IT development projects and the focus of the investigation was to analyze RE challenges. We analyzed the interview data with open-coding content analysis [21]. A large number of challenges and background information was identified based on the interviews and they were analyzed together with the challenges identified from the project documentation. The challenges were clustered to categories and modelled further based on validation feedback. The first author of the paper was responsible for the analysis. She had worked in the organization in a wide variety of roles and, therefore had practical experience with the company's RE practices and development projects.

Five workshops were organized to validate the findings with the interviewees and IT management. During the validation workshops, the first author presented the results of the analysis and the participants gave feedback on the results. The validation workshops lasted 2-4 hours. The results of the analysis were also validated iteratively by the two researchers. The second author had participated in a previous RE process development project of the case study company and had, therefore, some background knowledge about the customer organization. The third author did not know the case study organization and her role was to act as an external reviewer of the findings. This paper was also reviewed by two IT executives.

#### 4 Challenges and Demands of RE Processes at Customer Organization

Based on the study, we identified 42 challenges that established demands upon the RE process development. These challenges were categorized during the analysis phase into seven themes that are presented in Figure 1. The following subsections describe the challenges and demands related to the seven themes.



**Fig. 1.** Categories of the challenges related to the customer organization's RE process

#### 4.1 Human Resources, Organizational Capabilities and Knowledge

Human resources, organizational capabilities and knowledge of the individuals in the project team was one of the main themes identified. The main focus of the customer organization is on the business and, therefore, there are only a limited number of professional developers. As most of the practitioners participate in development part-time, RE processes, practices and tools needed to be adapted to the resources of the semi-professional business organization.

Based on the study, the amount of time, resources, knowledge and skills needed for requirements definition in large-scale projects came by a surprise to the interviewees. The importance of requirements was underestimated or misunderstood by the business people and there was a hurry to move on to implementation of the project. Furthermore, knowledge and willingness to use practices varied in the organization.

In the highly integrated IT system environment, the amount of internal stakeholders tends to grow large: business management, end users, specialists in different business units, process or business developers, IT architects and IT management. Customer organizations have political aspects to be considered, as different stakeholders often have conflicting requirements based on their organizational responsibilities. In the studied projects, a large amount of external stakeholders was also identified: officials, legislators, external business partners, and other companies in the field with common IT solutions. The importance of taking customer needs (customer of the customer organization) into account has also been a trend. Challenges and related demands are summarized in Table 2.

**Table 2.** Summary of the challenges related to human resources, capabilities and knowledge

Challenges	Demands for RE process development
Semi-professional practitioners	RE process documentation, models and tools must be understandable for business practitioners without extensive technical training and skills.
Limited development resources	With the resources available, best-fitting RE processes and practices should be selected to maximize the benefits.
Need for support of the RE process	Practitioners require support when utilizing new RE practices and tools for the first time. Practical training and hands-on support were preferred by the practitioners.
Cultural differences inside the organization	Organizational change management is needed to communicate the importance of requirements and implement RE processes in practice.
Large number of stakeholders	The RE process is needed as a tool to build common understanding among the stakeholders. In addition to internal stakeholders, the importance of external stakeholders and customers of the customer organization has also increased.
Selecting a RE project team	Customer organizations' project teams should consist of business specialists with in-depth and comprehensive knowledge of business processes, requirements analysts gathering requirements and skilled project managers.

## 4.2 Business Development and IT as Whole

In the case study organization, IT development is seen as one part of business development and the best total effectiveness has been achieved in programs developing both business and IT. Previously the business development has been IT-intensive, and more focused on improvement of the current state. Now, the focus is on development of the whole operating model and making strategic transformations via development programs. Challenges related are summarized in Table 3.

**Table 3.** Summary of the challenges related to business development and IT as whole

Challenges	Demands for RE process development
Development of the whole operation model instead of only IT	IT development was seen as a part of the development toolbox. Customer organizations' scope is to improve and develop business as a whole; i.e., business processes and services, organization and IT.
Steering projects based on strategic goals	Development programs and projects are seen as an important tool to accomplish company strategies through strategic transformation. Strategic development goals were seen as high-level requirements steering the project. Requirements gathered from users and other stakeholders should be prioritized by the goals defined.
Combining business process development and IT system development	Business process development brings requirements to system development and IT system development opportunities and limitations to business process development. Requirements are a tool to combine both approaches. Also, Business Driven Development (BDD) [22] was utilized in the subject organization in four development projects.
Managing organizational change and business transformation	Customers' project scope includes also organizational change management, business transformation and other activities related to changing the software tools used in the business processes. The supplier implementing the system has the project scope.
Long lifecycle of requirements	Customers' RE processes begin much earlier than software project and last to the end of the solutions lifecycle – from the development idea to business benefits. The lifecycle of a requirement may last for a quarter of a century. In an ideal case, requirements are up to date and a part of maintenance documentation.
Traceability from the business requirement to the benefits received	Requirements have a major impact upon the business benefits delivered. In the projects studied, IT development did not always deliver solutions that fulfilled the requirements and targeted business benefits were compromised. In an ideal case, traceability exists from a business requirement to implementation. The interviewees emphasized that being active in requirements management is important for delivering the expected benefits.

### 4.3 Decision-Making Processes

Connecting requirements engineering to the decision-making processes of the customer organization was identified one of the important themes. The connection to procurement and project management processes was identified: the project scope is defined by requirements; solutions fulfilling the requirements should be selected, as well as the software supplier. Also, a link to the customer organization's financial processes exists: requirements have major impacts upon development costs, maintenance costs and business value delivered. Challenges related to decision-making processes are summarized in Table 4.

**Table 4.** Summary of the challenges related to decision-making processes

Challenges	Demands for RE process development
Scoping and planning the project	Well-defined requirements scope the project and concretize the project goals. Requirements are a useful tool in project task planning.
Linking requirements to business case	Business case estimation and investment calculation were seen as tools to link the goals, scope, requirements, development and maintenance costs, and expected benefits together. Good requirements are so concrete that benefit and cost estimation can be done. An iterative approach has been useful because the organization learns during the requirements definitions, procurement state and implementation of the project.
Involving management and making decisions	Management should define goals as well as review and accept high-level requirements. Requirements management should be actively performed to analyze possible changes to goals and desired benefits.
Prioritization of requirements and requirements sets	The importance of prioritization of requirements was emphasized to focus upon strategic development, limit scope and improve cost efficiency. To maximize the benefits received from the development, requirements delivering the highest benefits should be implemented. Investment calculation for each requirement of a large project is impossible, but a rough estimation of costs and benefits is also useful.
Selecting the supplier and solutions that meet the requirements	When selecting the supplier to deliver the implementation project, bids should be evaluated based on the requirements. In addition to high quality and low costs, solution should meet the requirements.
Acceptance of the solution delivery based on the requirements	Acceptance testing and validation of the delivery should be done based on the requirements. However, in most of the projects studied, more detailed design specifications replaced original requirements in test planning.
Managing actively requirements	Requirements management should be performed actively during the procurement and project. Requirements should be up-to-date throughout the project.

#### 4.4 Sourcing Model

Based on the study, the company's sourcing model has a major impact upon the RE processes, techniques, tools and resources needed. Three sourcing models were identified from the projects studied: 1) in-house, 2) outsourced partnership, 3) outsourced development with procurement procedures. In addition to three models, most of the projects/programs studied had multiple suppliers, up to 15; and, as a specialty of the business field, common IT system development projects between several customer organizations exist. A summary of the related challenges is defined in Table 5.

**Table 5.** Summary of the challenges related to sourcing model

Challenges	Demands for RE process development
In-house development	The organization has an internal common RE process, informal and close cooperation between its business and IT people, internal development costs and decision making.
Outsourced partnership development	Established RE processes with the customer and IT development partner; cooperation usually begins in the early phases of the requirements definition, which eases the work of customer organization; external development costs limit the use of partner organization specialists; partner has business and IT environment knowledge.
Outsourced development with procurement procedures	Customer organizations need to define high-quality requirements independently for the procurement/RFQ process; cooperation with the supplier begins after procurement; new supplier needs to learn the business and IT environment; common RE process must be established during the first project; and, in the projects studied, subsequent projects are easier as the partnership is established.
Multi-supplier projects	Customer organizations have a role as an integrator of the whole; several suppliers deliver components for the solution; one business requirement often has dependencies upon many projects and good requirements management practices are needed to support projects; utilizing tools in requirements management has been beneficial; requirements management must be effectively performed to keep track of solutions delivered by different suppliers; well defined and managed requirements are needed to glue all the parts into the solution to deliver business value.
Multi-customer projects	Negotiation of requirements between the customers is important. Combining business needs, IT environment and systems for common interfaces, registers and system logic.



#### 4.5 Type of Solution

Based on the interviews and study of the projects, five categories of solution types were characteristic: 1) tailored software implementation, 2) implementation of software product (COTS), 3) software as service (SaaS) or buying outsourced services, including IT, 4) development of current IT systems, 5) integration work. Based on the study, the selection of a solution had an impact upon the RE tasks; amount of work and cooperation with the supplier and support for different kind of solutions were required from the RE process. Different solution types identified in the projects are summarized in Table 6.

**Table 6.** Summary of the challenges related to type of the solution

Challenges	Demands for RE process development
Tailored software implementation	In the large-scale tailored implementation projects, requirements definition work demands a lot of time, resources and modeling skills. All the functional and non-functional requirements needed must be defined. Cooperation between the customer and supplier is vital to share the knowledge and workload of large-scale requirements definition work. As an advantage, the process may be defined based on the business needs. Previously most of the solutions were tailor made; today, however, this is rare.
Software product implementation (COTS)	Business requirements and, usually, functional and non-functional requirements are needed to compare software products. From the customer point of view, it is vital to understand how requirements may be fulfilled (basic functionality vs. configurations vs. modification) and cooperation with suppliers is needed. In addition to software product implementation projects, the solution usually requires modifications to other systems and integrations – requirements for these parts should also be defined. Usually, the company's own business processes are adjusted to the processes supported by the software product, instead of modifying the product, to avoid increased maintenance cost.
Software as a Service or buying an outsourced service	Requirements are needed to compare the services offered by different service providers. The organization's internal process is adjusted to the process supported by the standard service.
Development of current IT systems	Large-scale projects were implemented to current IT systems due, for example, to changes in legislation or increases in automation level. Understanding of the current solution is needed and system documentation is used as a basis of the requirements definition work. Cooperation with the supplier in the early phases of requirements definition was seen as beneficial.
Integration work	All programs studied included integration work, from 10% up to 100% of total workload. Both business- and architecture-related requirements are relevant.

#### 4.6 Distributed RE Process between Customer and Suppliers

Requirements engineering is cooperation between the customer and the supplier organization. The customer organization owns the requirements and has the business knowledge. The supplier has technical knowledge. In the projects studied, the customer had the main responsibility of defining high-level requirements, while the supplier was responsible for more detailed specifications. The challenges related to distributed RE processes are summarized in Table 7.

**Table 7.** Summary of the challenges related to distributed RE process

Challenges	Demands for RE process development
Optimized cooperation in the RE process with the supplier	Cooperation with the supplier in the early phases was seen as beneficial in many projects to transfer knowledge for implementation.
Distribution of RE work between the customer and a supplier	Based on the study, customer organizations should have internal or external requirements analysts to produce high quality requirements for procurement of large-scale projects. Also, internal RE processes and tool support were needed by the practitioners. The supplier's skilled requirements analysts were important for project success.
High quality requirements for RFQ/RFP and procurement	For RFQ (Request for Quote) or RFP (Request for Proposal), customer organizations need to define requirements and their own or external RE resources are needed. Requirements direct suppliers to provide comparable bids – all suppliers must receive the same information.
Iteratively improving requirements in cooperation with suppliers	Requirements definition is a learning process; from 2–4 iterations were performed in the studied projects. The customer learns from the solutions available and the supplier learns from the customer's needs and environment.
Common understanding of the project scope and complexity	In addition to written requirements, discussions and clarifications are needed to build common understanding and trust. Customers need to understand how the solution meets their requirements and suppliers must to understand business needs and the whole complexity of the project.
Requirements vital part of the project contract	Requirements are a vital part of a contract between a customer and a supplier and thus a baseline of the scope. Also, agile projects demand high-level scoping.
Negotiation of RE practices	The system work models, modeling techniques, tools, responsibilities and distribution of work varied based on the supplier. RE practices need to be negotiated.
Design specifications defined by the supplier specify the solution	Requirements are further specified during the system specifications. Customer organizations define the requirements and suppliers have documentation responsibility for design specifications in cooperation with the customer.

#### 4.7 IT Environment, Enterprise Architecture and Development Portfolio

Program portfolio and the size and complexity of the project bring demands to RE processes. Requirements modeling techniques varied in the projects studied, as the modeling demands in different application domains are different. In the customer organizations, each project is somewhat unique and implemented only once, whereas software suppliers may learn from previous projects with certain software products, technology and application domains.

Also, the importance of enterprise architecture has increased, as the number of technologies and complexity of solutions has grown rapidly. Projects hardly ever begin from scratch and the solutions made must fit into the company's technical environment – requirements from the enterprise architecture and other systems to be integrated must be collected. In addition to the enterprise architecture approach, solution architecture is needed in mapping the requirements to solutions. Also, a solution may fit the business need, but it may cause high maintenance costs if it is unsuitable for the IT environment. The customer organization must have a lifecycle approach. Sustainable long-term solutions are needed, not just fast and cheap solutions from the project scope. Challenges and related demands are summarized in Table 8.

**Table 8.** Summary of the challenges related to company IT environment, enterprise architecture and development portfolio

Challenges	Demands for RE process development
Development program portfolio, size and complexity of the projects	Complex large-scale projects require different practices, tools and support from the RE process than small maintenance projects. The RE process, practices and tools were developed in the case study organization to better support large projects.
Enterprise architecture, IT environment and maintenance	Enterprise architecture, current IT environment and maintenance of the systems bring limitations and requirements. Negotiation of the technical or non-functional requirements is essential as they often have an impact upon the selected solutions and may add costs.
Different types of projects and solutions	RE process and practices must be flexible to support the needs of different types of projects, whether it is about renewing service production processes, ERP implementation or mandatory changes to legacy systems. However, the core of the RE process may be similar in all the projects.
Other development methods, models and frameworks utilized	RE processes should fit into the methods, models and frameworks utilized in the company that are related to business development, program and project management, enterprise architecture, procurement, risk management and other related processes.
Modeling comprehensive requirements from the enterprise context	Requirements modeling should cover comprehensively different aspects from the enterprise context: service design, business processes, business logic and functionality, data, integrations, IT solution should also fit into enterprise architecture.

## 5 Discussion

We identified seven categories of challenges that establish demands to the customer organization's RE process. This case study describes a complex environment in which the customer organization develops IT systems, and it systematically defines challenges related to the RE process. The results of the study are based on the 17 interviews of practitioners from different roles, experiences gathered from the 15 strategic large outsourced projects and the in-depth analysis of the current state in one customer organization. Here we discuss the main findings of the case study and relate them to existing RE literature.

Our results emphasize the importance of understanding the current state of resources available, organizational capabilities and knowledge in the RE process development. It is important to select RE practices and tools that support the needs of the customer organization. *The customer organization has the business knowledge and ownership of requirements, but it was unclear what capabilities and roles customer organization should have and which RE activities can be outsourced in the distributed RE process.* Our previous case studies have also highlighted the importance of human factors, and the usefulness and practicality of the RE process [15]. Furthermore, adequate RE processes and role awareness [3] and high-level customer involvement [6] have enhanced the success of RE processes.

The business focus is an important characteristic of the customer organization's RE process. Instead of just IT systems development, the development of the whole operating model (business processes, services, organization and IT systems) was emphasized in this study. Business development sets requirements to system development and vice versa. Furthermore, a business requirement may often be fulfilled by both system requirements and business development tasks. The business process focus has also been identified as a current RE trend by Hansen, Berente and Lyytinen [4]. *In the case study company, two important questions are: 1) how can business and IT development be combined effectively in the RE process and 2) can business-driven development [22] bring IT and business closer together?* Combining process modeling to service design and service blueprinting [24] might be a good combination in the future development projects.

From the point of view of the case study organization, requirements were an essential tool to ensure that the expected benefits are received with the accepted costs. A critical question is *how to connect the RE process to business case estimation, project scoping, procurement and other decision-making processes of the company.* Studies related to scoping projects effectively [6] and requirements prioritization, for example, extreme prioritization [12] may be useful. Strategy steering and goal orientation were also identified as notable themes. Also a relevant question is *how to steer projects to achieve strategic development goals?* The goal-oriented RE [24] [25] could bring business goals closer to the RE process of the case study organization.

RE processes in the outsourced environment requires close co-operation between the customer and the supplier. Requirements evolve iteratively during requirements definition, procurement and implementation of projects between the customer and the supplier. The importance of communication between the stakeholders in addition to

high quality documentation, handshaking and discussions between the customer and supplier were emphasized in the study. In practice, *what kind of RE process should be used to transfer knowledge between the customer and the supplier efficiently in outsourced projects during procurement and implementation of the project?* Agile RE practices such as iterative RE and face-to-face communication [12] might yield solutions. Furthermore, shared goal, culture, process, responsibility and trust between the customer and the vendor were identified as success factors of offshore outsourcing projects [5]. Tiwana suggests that totally novel projects require extensive client-vendor communication across all phases of the development projects; customer should have more technology knowledge and vendor more business knowledge [26].

Based on the study, the sourcing model has a major impact upon the RE process in the outsourced environment. In the literature, distributed requirements and interdependent complexity have been identified as RE trends [4], and a long-term relationship with a service provider organization, domain knowledge, communication and trust as success factors of the RE process [14]. Our findings indicate that the complexity of the requirements management increased in the projects with multiple suppliers. In the studied projects, the number of suppliers climbed as high as 15 due to the highly integrated systems and a business requirement was fulfilled by several solutions delivered by different suppliers. The customer acted as an integrator and had a responsibility to coordinate all suppliers to deliver implementation matching the requirements. The question is *how to deal with RE challenges in complex multi-supplier projects with suppliers with software development methods, processes and tools?*

In the literature, packaged software and integration focus have been identified as current RE trends [5]. These were also a trend in the studied projects. Our findings also support the findings of Sadraei et al. who report that the RE process is highly dependent upon the context [3]. Based on the study, type of the solution had an impact upon the RE workload, RE activities needed: tailored software solutions needed detailed RE models, whereas in the projects related to software products, understanding of how products features meet the requirements was considered essential.

The number of available requirements modeling techniques, frameworks and tools is high and it is challenging to select the most suitable technique for the project context. Based on our study, requirements modeling should cover different aspects: strategic development goals, business processes, service design, functionality, information and data, system integrations and IT infrastructure. Typically, several modelling techniques, tools and extensive modelling skills were needed to model requirements for procurement. One of the open questions is *how to support needs of the customer organization in requirements modeling?*

Centrality of architecture has been identified as a current RE trend [4] and modeling system environment and architecture have been identified as significant RE practices for outsourced projects [18]. Our findings also indicate that both enterprise and solution architectures are important in the context of RE processes.

## 6 Threats to Validity

Threats to validity were analyzed based on the framework by Runeson et al. [27]. The first author of the paper is an employee of the case study organization, which is both a strength and a possible threat to validity of the results. Based on the practical experience of the case study organization's RE process and projects, the author has background information to deeply understand the research context. Also, interviewees were comfortable and motivated to discuss challenges as results were also used in the case study organization's RE process development and the researcher had access to all necessary project documentation. As a threat, the researcher's own experience may have affected the interpretation of the results. To improve reliability of the results and avoid biased interpretation, we used investigator triangulation. Two external researchers participated in the case study planning and the analysis of the results. To avoid construct validity threats, we organized validation workshops where the practitioners of the case study company reviewed the findings iteratively.

As an external validity threat, the results of a single organization may not be generalized as such to other customer organizations. To validate the results further, studies of RE challenges in other customer organizations would be beneficial. However, similar kind of organization structures, processes and sourcing models are used by other organizations in the banking and insurance sector as well as in many public sector organizations, and thus, the challenges and further research topics identified may be relevant for a large number of organizations. The identified demands for RE process development may bring useful viewpoints for RE process developers and practitioners participating in IT development projects. In addition, the findings may be useful for supplier organizations to understand better customers' challenges and to improve cooperation in the RE process.

## 7 Conclusions

Our case study suggests that the development of the customer organization's RE process in the outsourced environment is both critical and challenging. We identified 42 challenges that bring demands to the RE process. It is very important that the RE process supports a company's development processes such as procurement, software project management and business process development. The RE process should also satisfy demands that come from the IT environment and enterprise architecture. In the customer organization, the focus is more on the strategic business goals, business process development and stakeholder needs, and IT is one of the tools to develop business. The RE process documentation and good RE practices must be understandable for business personnel without extensive RE training and skills.

The RE process must also be flexible. The sourcing model and the type of the solution have a significant impact on how requirements work is done in projects. Close cooperation with suppliers is also a vital part of the distributed RE process. Requirements evolve iteratively during collaboration. Therefore, requirements should be actively managed with the supplier throughout requirements definition, procurement and implementation of projects.

This paper is both an experience report from a case study organization and a problem statement of the RE challenges that a customer organization can have in the outsourced environment. We hope that the results of this case study serve as an inspiration for other RE researchers who are interested in solving complex challenges. We also hope that the results are useful to other customer organizations and software suppliers. In the future, we will focus on two research questions. Firstly, we will investigate how to combine business and IT development in the RE process. Secondly, we will study more closely the distribution of the RE process between the customer and supplier in the outsourced environment.

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